

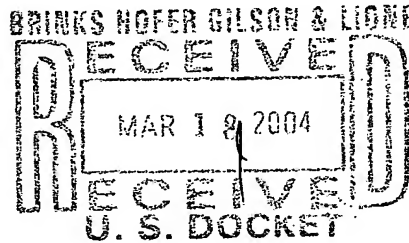


# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/043,739	01/09/2002	Masayoshi Nakagawa	9281-4241	6542

7590 03/15/2004  
Brinks Hofer Gilson & Lione  
P.O. Box 10395  
Chicago, IL 60610



EXAMINER	
MAGEE, CHRISTOPHER R	
ART UNIT	PAPER NUMBER
2653	

DATE MAILED: 03/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/043,739

Applicant(s)

NAKAGAWA ET AL.

Examiner

Christopher R. Magee

Art Unit

2653

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 07 January 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 and 20 is/are rejected.
- 7) ☒ Claim(s) 16-19 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____  |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### *Response to Amendment*

#### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

*(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.*

1. Claims 1, 3, 6-8, 10, 13-15 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wada et al. (hereinafter Wada) (US Patent Application 2001/0004303 A1) in view of Nishida et al. (hereinafter Nishida).

- Regarding claims 1, 8, 15 and 20, Wada discloses a magnetic head actuator having a finely movable tracking device (para.0033, lines 1-5), comprising: a swing arm extending in a first plane and (main actuator in para. 0034) having a magnetic head 12a at a free end reciprocally movable around a coarse rotation axis of a base of the swing arm (para. 0034, lines 1-3); a piezoelectric element 11 having a voltage-impressing electrode 22 (para. 0053, lines 3-9) for allowing a fine arcuate movement of the free end around the coarse rotation axis in response to an applied voltage (para. 0055, lines 6-25 and para. 0056, lines 1-6); and an FPC board 18a-c having a resin base and a feeding line (end of 18b, 22) embedded in the resin base (para. 0042, lines 9-14) for feeding power to the voltage-impressing electrode (para. 0043, lines 4-7), wherein a portion of the resin base is removed to expose a portion of the feeding line that extends onto the electrode (end of 18b touching 22; para. 0042, lines 14-18; figures 2 and 3) extending onto the voltage-impressing electrode, and wherein there is an electrical connection between the

Art Unit: 2653

voltage-impressing electrode and the exposed portion of the feeding line (para. 0042 and 0047; figures 2 and 3).

Wada fails to disclose that there is a piezoelectric element suspended between two sections of the swing arm, the swing arm having an opening wherein the opening is defined by edges extending in a second plane substantially perpendicular to the first plane. Additionally, the piezoelectric elements are attached within the opening by a nonshrinkable adhesive and there is a direct physical connection between the voltage-impressing electrode and the exposed portion of the feeding line.

Nishida teaches a piezoelectric element is suspended between two sections of the swing arm, the swing arm having an opening wherein the opening is defined by edges extending in a second plane substantially perpendicular to the first plane (col. 4, lines 54-65; Figs. 2-4). Additionally, the piezoelectric elements are attached within the opening by a nonshrinkable adhesive (col. 5, lines 35-44) and there is a direct physical connection between the voltage-impressing electrode and the exposed portion of the feeding line (Fig. 4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the piezoelectric element of Wada such that it is suspended between two sections of the swing arm by a non-shrinkable adhesive, as taught by Nishida.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to modify the piezoelectric element of Wada such that it is suspended between two sections of the swing arm by an adhesive, as taught by Nishida because doing so allows for accurate position control of the slider (Nishida; col. 1, lines 33-36).

Second, it would have been obvious to one of ordinary skill in the art at the time the invention was made to connect the voltage-impressing electrode and the exposed portion of the feeding line of Wada with a direct physical connection as taught by Nishida.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to connect the voltage-impressing electrode and the exposed portion of the feeding line of Wada with a direct physical connection as taught by Nishida so that resistance change between the components can be decreased.

- Regarding claims 6 and 13, Wada fails to disclose a pair of piezoelectric elements having polarities opposite to each other.

Nishida discloses a pair of piezoelectric elements having opposite polarities (col. 2, lines 665-67).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the piezoelectric structure of Wada such that it comprises a pair of piezoelectric elements having opposite polarities as taught by Nishida.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to modify the piezoelectric structure of Wada such that it comprises a pair of piezoelectric elements having opposite polarities as taught by Nishida so that with the application of a voltage, the first electrode of piezoelectric ceramic element is grounded on the actuator base and a wire is bonded to the second electrode, an appropriate clearance for electrical insulation can be secured between the second electrode and the actuator base (Nishida; col. 3, lines 2-7).

Art Unit: 2653

- Regarding claims 7 and 14, Wada teaches a trace line 18a leading to the magnetic head and extending, together with the feeding line 18b in the FPC board (Fig. 2).
- Regarding claim 10, Wada discloses that the electrical connection between the magnetic head slider and the FPC feeding line comprises an Au ball bond (para. 0044, lines 1-7). Wada does not specify the means by which the piezoelectric element electrodes are connected to the FPC trace lines. The electrical connection between the FPC and the piezoelectric element is considered to comprise Au ball bonds. Assuming arguendo, the elements are connected by a means other than ball bonding.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to specify that the connection between the FPC feeding line and the piezoelectric element electrode of Wada comprises an Au ball bond.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to provide the connection between the FPC feeding line and the piezoelectric element electrode of Wada with an Au ball bond because Wada teaches that Au ball bonding provides adequate electrical connections between magnetic head elements and FPC lines (para. 0044).

2. Claims 4, 5, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wada et al. (hereinafter Wada) (US Patent Application 2001/0004303 A1) and Nishida et al. (hereinafter Nishida) as applied to claims 1 and 8 above, and further in view of Pattanaik (US 5,815,347).

Art Unit: 2653

- Regarding claims 4 and 11, Wada and Nishida show all the features except a through hole in the exposed portion of the feeding line, wherein the electrical connection is made using a gold ball positioned in the through hole.

Wada teaches that the electrical connection between FPC feeding lines and magnetic head element electrodes is made using a gold ball (para. 0044, lines 1-7)

Pattanaik discloses a through hole 8 in a bonding section of flex cable 9 (col. 7, lines 30-40; figures 7 and 8b), wherein the electrical connection between the flex cable traces and the termination pads 5 of a magnetic head element is made using a conductive ball positioned in the through hole (col. 8, lines 21-27).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the magnetic head actuator of Wada and Nishida such that a through hole is provided in the feeding line, wherein the electrical connection is made using a conductor positioned in a through hole, as taught by Pattanaik.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to modify the magnetic head actuator of Wada and Nishida such that a through hole is provided in the feeding line, wherein the electrical connection is made using a conductor positioned in a through hole, as taught by Pattanaik because a connection of this type form a very solid electrical and mechanical connection (Pattanaik; col. 9, lines 15-22), simplify the manufacturing process of the suspension, and have relaxed alignment requirements (col. 9, lines 8-10).

- Regarding claims 5 and 12, Wada and Nishida disclose an electrical connection between the exposed portion of the feeding line and the voltage impressing electrode, as explained supra.

Art Unit: 2653

Wada fails to teach a stud bump made of a conductive material residing on the piezoelectric element and a through hole located in the exposed portion of the feeding line.

Pattanaik discloses a stud bump 4 made of a conductive material (col. 8, line 17) residing on a electrode of a magnetic head element (col. 8, lines 21-22) and a through hole 8 located in a connection portion of the flex cable 9, wherein the electrical connection is made by positioning the stud bump in the through hole (col. 8, lines 14-27).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the magnetic head actuator of Wada and Nishida such that it includes a stud bump on the piezoelectric element electrode and a through hole in the FPC , as taught by Pattaniak.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to modify the magnetic head actuator of Wada and Nishida such that it includes a stud bump on the piezoelectric element electrode and a through hole in the FPC , as taught by Pattaniak because a connection of this type results in a very solid electrical and mechanical connection (Pattanaik; col. 9, lines 15-22).

3. Claims 2 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wada et al. (hereinafter Wada) (US Patent Application 2001/0004303 A1) and Nishida et al. (hereinafter Nishida) as applied to claims 1 and 8 above, and further in view of Hayden et al. (hereinafter Hayden) (US 6,019,271).

- Regarding claims 2 and 9, Wada and Nishida show all the features except the electrical connection comprises an ultrasonic bond.



Hayden teaches an electrical connection comprising an ultra sonic bond, wherein a portion of the material of the feeding line resides in the voltage impressing electrode (col. 1, 11-67)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the electrical bond of Wada and Nishida such that it the connection is an ultrasonic bond , as taught by Hayden.

The rationale is as follows: One of ordinary skill in the art at the time of the invention would have been motivated to modify the electrical bond of Wada and Nishida such that it the connection is an ultrasonic bond , as taught by Hayden, because ultrasonic bonding is frequently used in electronics to bond flex circuits to terminals (Hayden; col. 1, lines 43-49) and ultrasonic bonding tends to be less damaging to the flex circuit or component substrates than the comparable bonding methods (Hayden, col. 1, lines 55-60).

***Allowable Subject Matter***

Claims 16-19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

*Response to Arguments*

Applicant's arguments with respect to claims 1-14 have been considered but are moot in view of the new ground(s) of rejection.

*Conclusion*

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- Imamura et al. (US 5,764,444) is cited to show a mechanism for minute movement of a head.
- Mei (US 6,239,953 B1) is cited to show a microactuated disk drive suspension with heightened stroke sensitivity.
- Hawwa et al. (US 6,421,211 B1) is cited to show a disk drive actuator arm with microactuated read/write head positioning.
- Shimizu et al. (US 6,614,627 B1) is cited to show a magnetic disk apparatus with a micropositioning actuator.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after

Art Unit: 2653

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher R. Magee whose telephone number is (703) 605-4256. The examiner can normally be reached on M-F, 8: 00 am-5: 30 pm.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, William Korzuch can be reached on (703) 305-6137. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Christopher R. Magee  
Patent Examiner  
Art Unit 2653

March 11, 2004



WILLIAM KORZUCH  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 2600